CLAIMS

What Is Claimed Is:

1. A heterodyne interferometer system with carrier phase modulation comprising:

a laser light source;

a phase modulator positioned to receive a beam from the laser light source and apply a sinusoidal carrier phase modulation;

a frequency shifter for shifting the frequency of a target beam and a local beam emanating from the phase modulator, the difference between the target beam frequency and the local beam frequency designated as the heterodyne frequency f;

a reference photodetector;

a signal photodetector;

a beam splitter for deflecting a portion of the target beam and local beam to the reference photodetector and directing another portion of the target beam and local beam to a polarizing beam splitter;

a polarizing beam splitter for directing the local beam directly to the signal photodetector, and for directing the target beam to a pair of reflectors separated in distance by L;

a signal mixer for mixing the phase-modulation frequency with the output of the signal photodetector to shift the target signal to the heterodyne frequency f and shifting a self-interference signal into sidebands about the modulation frequency;

a bandpass filter at the heterodyne frequency f to isolate the target signal and exclude the self-interference signal; and

a phase meter to receive signals from the reference photodetector and compare the phase with a phase of the target signal filtered by the bandpass filter.

2. The heterodyne interferometer system of claim 1 wherein the phase modulation frequency is selected to optimize the target signal having traveled the distance L.

3. The heterodyne interferometer system of claim 1 wherein the target beam and the local beam are polarized in orthogonal planes.

4. The heterodyne interferometer system of claim 1 wherein the target beam is synchronously demodulated at the phase modulation frequency.

5. The heterodyne interferometer system of claim 1 wherein the self-interference signal is suppressed by a factor of L/L_{INT}.

6. The heterodyne interferometer system of claim 1 further comprising a second frequency shifter.

7. A heterodyne interferometer comprising:

a light source for providing a carrier signal;

a modulator for modulating the carrier signal;

a target path for directing a first portion of the modulated carrier signal to a target;

a reference path for directing a second portion of the modulated carrier signal to a reference location; and

a comparitor for comparing the first portion of the modulated carrier signal with the second portion of the modulated carrier signal to determine a distance between the target and a fixed point.

8. The heterodyne interferometer of Claim 7 wherein the modulator applies a phase modulation at a modulation frequency to the carrier signal, and wherein the first portion of the modulated carrier signal is demodulated at the modulation frequency after being directed to the target.

9. The heterodyne interferometer of Claim 8 further comprising a frequency shifter for shifting the frequency of the carrier signal prior to the directing of the first and second portions of the carrier signal to the target and reference location, respectively.

10. The heterodyne interferometer of Claim 8 wherein the comparitor comprises an intensity comparitor to discriminate between a signal traveling from the target with a parasitic self-interference signal.

11. A method for distinguishing a target signal in a heterodyne interferometer with a parasitic interference signal comprising the steps of:

providing a signal source to deliver a carrier signal;

applying a modulation to the carrier signal, where said modulation is selected from one of phase modulation and frequency modulation;

directing a first portion of the modulated carrier signal to a path that includes a target, where the heterodyne interferometer evaluates a distance between a fixed location and the target;

directing a second portion of the modulated carrier signal to a reference location;

demodulating the first portion of the modulated carrier signal at a frequency selected based upon the modulation of the carrier signal; and

evaluating an interference intensity modulation to discriminate between a parasitic interference and a portion of the modulated carrier signal that has traveled to the target.

12. The method of claim 11 further comprising the step of shifting the frequency of the carrier signal prior to directing the first and second portions of the modulated carrier signal.

13. The method of claim 11 wherein the step of modulating the carrier signal comprises a phase modulation.

14. A method for filtering a self-interference signal in a heterodyne interferometer from a true signal based on a phase difference between the self-interference signal and the true signal comprising the steps of:

providing a carrier signal;

phase modulating the carrier signal at a modulation frequency Ω;

directing a portion of the modulated carrier signal to a target and providing for a return of the portion of the modulated carrier signal from the target, the portion of the modulated carrier signal having traveled to and from the target being designated as a true signal;

providing a photodetector for receiving both the true signal and an interference signal;

demodulating the output of the photodetector at the modulation frequency Ω to isolate the interference signal from the true signal; and

filtering the interference signal from the true signal based on the isolation of the previous step.